INEEL REPORTER
A closer look at science-based environmental management
October/November 2000

A Look Inside

Ongoing Probing Campaign Yielding Valuable Information About Buried Waste

Work is progressing on a project to remediate nuclear waste buried before 1970 in unlined pits and trenches at the INEEL's Subsurface Disposal Area. A team of engineers and scientists have spent more than three months drilling a series of probe holes, to gather information to learn more about the waste and how it behaves in the ground.

By Oct. 25, the team had drilled 17 probe holes in the SDA's Pit 10, where waste containing the radionuclides plutonium, americium and uranium is buried. They also had drilled 25 probe holes in Pit 4, where waste containing the hazardous solvent carbon tetrachloride is buried. The holes are made with a drill that uses sonic waves to sink steel probe tubes into the pits.

The team plans to install about 70 probe holes into Pit 4 and Pit 10. When probe holes are completed, geophysical instruments are lowered into the holes, and measurements of radioactivity, moisture and chlorine are taken.

Following completion of probing, the team will place a set of instrumented probes in select areas of Pit 4 and Pit 10. They will use the instrumented holes to collect vapor and any water from within the pits, to determine soil vapor composition, and soil moisture content and chemistry. The goal of the sampling is to enhance our understanding of the buried waste composition, and to determine the extent of contaminant movement through the disposal site.

Scientists install a Type A probe at RWMC's Subsurface Disposal Area.

Pit 4 and Pit 10 are part of the 88-acre Subsurface Disposal Area at the INEEL's Radioactive Waste Management Complex, located about 6 miles north of Big Southern Butte. Mixed, transuranic and low level radioactive waste was buried there before 1970. Almost all waste in the Subsurface Disposal Area was generated in the 1950s and 1960s at a now-closed plant called Rocky Flats near Denver, Colorado during U.S. production of the plutonium centers of nuclear missile warheads.

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The probing in pits 4 and 10 is the INEEL Environmental Restoration Program's first attempt at probing into Rocky Flats waste in the Subsurface Disposal Area outside of probing at Pit 9 that began in 1999, and continues this year. Pit 9 is a one-acre pit in the Subsurface Disposal Area where Rocky Flats waste was buried in 1969.

From 20 probe holes placed in Pit 9 so far, the team has gained information indicating how deep the waste layer is, where the soil and bedrock meet, and the apparent distribution of contaminants in the study portion of the pit. They've also demonstrated the capability to identify and characterize localized areas of plutonium contamination.

Information the team gathers using instruments lowered down present and future probe tubes is intended to give U.S. Department of Energy, U.S. Environmental Protection Agency and state of Idaho decision-makers a much better picture of what's going on underground in the Subsurface Disposal Area, including:

- Rates of contaminant migration.
- Extent of infiltration of rainwater and snowmelt.
- Composition and condition of the wastes.

These data will feed into a risk assessment and an analysis of cleanup alternatives that members of the team are conducting to help determine the best ways to reduce future human and environmental risks at the Subsurface Disposal Area.

Biological Study Conducted at Old Reactor Site Cap

Animal and plant samples gathered this year at INEEL's Boiling Water Reactor Experiment-I (BORAX-I) site indicate that a cobblestone cap completed in 1996 over buried contamination from the 1954 experiment is apparently keeping the contamination from coming into contact with the environment.

During a final BORAX-I test in 1954, scientists intentionally destroyed the reactor. This contaminated about 84,000 square feet of surrounding terrain. Initially, workers collected much of the radioactive cesium-contaminated debris and buried it in the reactor's shield tank. Soon after, workers put about 6 inches of gravel cover over the radioactive cesium-contaminated ground around the reactor.

Because contamination remained, state and federal officials in 1995 decided on a more thorough cleanup action. Workers moved all of the remaining contaminated soil and debris they could detect to the old reactor site, buried it and put the rip rap cap over it. Now scientists are using plant and animal samples to confirm that the cleanup action is preventing the spread of contamination.

During this past summer, scientists used an array of live traps baited with peanut butter, molasses and oats, and spaced evenly along transects to systematically capture deer mice, kangaroo rats and rabbits living in and around the cap.

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More Information

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The scientists picked these three species to study because these three kinds of animals eat a wide variety of native foods available at INEEL. This, in turn, represents a variety of possible biological pathways for potential ingestion of contaminants, if any of the three species come into contact with contaminants.

Also, the differing living habits of the three species means more possible ways for the animals to come into contact with contaminants.

For example, kangaroo rats build burrows in the ground and their food sources include seeds and insects. Also, kangaroo rats urinate less frequently than most desert animals, so if they ingest contaminants, those contaminants would have a greater chance of accumulating in the body – making contaminants in kangaroo rats easier to detect.

On the other hand, rabbits build nests within rocky areas and eat a wide variety of desert vegetation. The cobblestone cap over the BORAX-I site is an attractive home site for rabbits, especially when coupled with the fact that the fence around it makes it tough for coyotes to approach the cobbles and prey on them.

The baited traps captured the animals overnight. Each morning before the day got hot, scientists retrieved them from the traps, humanely harvested them, then froze the animals' carcasses. Each time they accumulated enough carcasses of a given species, they processed the sample and used instruments to look for various contaminants in it.

Scientists also gathered and tested plant samples. All plant and animal samples gathered around the BORAX-I site during the summer of 2000 either contained no contamination, or had very low levels of contamination that are similar to the levels found in plants and animals collected away from the INEEL.

The team plans to continue their biological testing in the future, and expand it to other cleanup sites around INEEL. Their goal is to look closer at other places on the INEEL site where plants and/or animals might be exposed to radiation from past INEEL operations, including the Radioactive Waste Management Complex.

"There's definitely much more work we can do to look for problems," said project manager Doug Burns. "All this tells us is that the animals we trapped and the plants we sampled didn't have any gross levels of contamination. That's good information, but there's more data that we need to gather before we can say that we completely understand how contamination affects the INEEL ecosystem."

Future studies might include using methods under development for examining the DNA in animals living at INEEL, looking for signs of genetic damage that might indicate exposure to contaminants.

A scientist removes a deer mouse from a trap at the BORAX-I cap site.

New Technology Solves Mystery of What is Inside Cylinders Buried During the 1950s

In an unprecidented application of technology, scientists this year demonstrated an environmental restoration use for a device developed by INEEL scientists in 1992 to identify the types of munitions inside military ordnance worldwide.

Members of the team remediating more than 50 gas cylinders buried near the Idaho Nuclear Technology and Engineering Center used INEEL's innovative Portable Isotopic Neutron Spectroscopy system (PINS) to safely verify the contents of four steel cylinders buried at the site during the 1950s.

The beauty of the PINS device is that it enables people to determine what is inside a container from the outside.

"It's a safe, non-intrusive analytical method," project manager Dennis Raunig said. "Anytime you can determine what's inside something without opening it up or tapping into it, your safety envelope is much greater."

Now that the team has confirmed that the cylinders contain extremely reactive and corrosive hydrogen flouride gas, workers know exactly what precautions to take in November when they are slated to dig them up before repackaging or neutralizing the gas.

Nuclear physicist Gus Caffrey was one of the INEEL scientists who developed PINS for national security. Caffrey and his team used it extensively worldwide during the 1990s to identify materials within old munitions ranging from nerve gases to explosives — without breaching shells or containers.

PINS works by shooting a beam of neutrons into the container. The neutrons bounce into the elements within and this interaction produces gamma rays. The gamma rays passing back out are then detected by a high-purity germanium spectrometer. Each chemical element emits a characteristic gamma-ray energy/intensity pattern. Field analysts carry a "library" of patterns and use this library to identify chemicals within.

"This incident marked the first use of PINS for an environmental application at any DOE facility," Caffrey said. "This is new for us and we haven't scratched the surface yet. I'd like to see more collaboration between the environmental groups and our team."

It took 200 seconds for PINS to identify the hydrogen flouride.

"It was fortunate that one of the cylinders was exposed," Caffrey said. "The standard PINS configuration looks at a cylinder horizontally and for safety concerns, we didn't want to disturb the surrounding soil without verifying the contents. But we are working on a new configuration that will allow PINS to be used at other angles."

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PINS has applications throughout the DOE complex, Raunig said. He noted that Sandia and environmental restoration scientists at Los Alamos national laboratories have expressed interest in the technology, because those sites also have cleanup projects involving compressed gases.

Banner Year for Waste Treatment and Disposal at INEEL

Less nuclear waste is stored on the Idaho desert, because of an extremely productive year for waste treatment and disposal at INEEL.

As fiscal year 2000 closed on Sept. 30, final numbers for waste treatment and disposal were tallied. Results show the commitment of INEEL toward getting waste out of storage and into permanent disposal. Treatment and disposal of stored waste reduces environmental liability and risk to workers.

The INEEL shipped 103 cubic meters of transuranic waste to the Waste Isolation Pilot Plant in New Mexico between July 26 and Sept. 30. This represents the largest volume shipped to date to the federal repository from Idaho. In 1999, the INEEL shipped 26 cubic meters to WIPP. Under terms of an agreement between the state of Idaho and DOE, 3,100 cubic meters of plutonium-contaminated waste must be removed by Dec. 31, 2002. INEEL plans to ship 1,160 cubic meters of transuranic waste in FY 2001, 1,483 cubic meters in FY 2002 and the remainder between October and December 2002 to meet the agreement milestone.

Mixed hazardous and radioactive waste treated at the Waste Experimental Reduction Facility exceeded prior years' treatment volumes. Approximately 837 cubic meters of mixed hazardous and radioactive waste were treated and 459 cubic meters disposed of off-site.

Low-level radioactive waste stored at INEEL was reduced to less than 800 cubic meters in FY 2000, as 2,990 cubic meters of low-level radioactive waste was treated through compaction and sizing. A total of 4,260 cubic meters of low-level radioactive waste was disposed of in INEEL's Radioactive Waste Management Complex disposal pit.

At the Idaho Nuclear Technology and Engineering Center, more than 90,000 gallons of liquid sodium-bearing waste was calcined before the calciner was placed into stand-by mode on June 1, under an agreement with the state of Idaho. Fifty high efficiency particulate air (HEPA) filters contaminated with hazardous constituents were also treated at INTEC, completing a Site Treatment Plan commitment for FY 2000.

Cleanup actions resulted treatment of more than 2.5 million gallons of groundwater for trichloroethylene (TCE) removal using bioremediation at Test Area North. Approximately 79,000 pounds of total volatile organic compounds have been removed from ground beneath the Radioactive Waste Management Complex since 1996, including more than 50,000 pounds of carbon tetrachloride.

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The INEEL continues to receive spent nuclear fuel from the U.S. Navy and foreign research reactors, for national security purposes. The INEEL also made strides during the past year to more safely store this spent fuel, by placing it in dry storage or more modern underwater facilities.

Briefly

Public meetings offered on Test Area North groundwater cleanup proposal. The public is invited to attend meetings on a proposed plan that defines the strategy for cleaning up contaminated groundwater at INEEL's Test Area North. A Dec. 5 meeting is at the Shilo Inn Conference Hotel, 780 Lindsay Boulevard in Idaho Falls. A Dec. 6 meeting is at the Ameritel Hotel, 1377 Blue Lakes Boulevard in Twin Falls. Between 6 p.m. and 7 p.m. both nights, project managers will be available to discuss the project with members of the public. Beginning at 7 p.m., people will have the opportunity to learn more about the proposed new remedy, ask questions and submit comments.

Radioactive Waste Management Complex workers complete a milestone for retrieving 15 drums of remote-handled transuranic waste five weeks early. Retrieval of this waste from the vaults will help in assessing INEEL's need for technologies in preparing the waste for disposal at the Waste Isolation Pilot Plant in New Mexico, help in determining drum integrity after long-term storage and provide accessible inventory for doing characterization work. The 15 drums were removed from Intermediate Level Transuranic Storage Facility and placed in 83-gallon shielded overpacks.

The U.S. Department of Energy in October decided to cease operating INEEL's Waste Experimental Reduction Facility incinerator as of Nov. 2, as specified by the state of Idaho's final denial of a Part B hazardous waste treatment permit for the facility. DOE decided to place the incinerator into cold stand-by and aggressively pursue alternative treatments for mixed (hazardous and radioactive) waste currently stored at INEEL – a decision consistent with DOE's decision earlier this year to stop burning waste in the unit by October 2001 under the U.S. Environmental Protection Agency's new air emission requirements.

How to Get Involved

Citizens are encouraged to get involved in decision-making at the INEEL by reviewing and commenting on documents, attending public meetings, and requesting briefings or tours. Information about these public involvement activities can be obtained through:

Target Mailing Lists

Mailing lists are continually updated so interested citizens and groups can automatically receive general or specific INEEL information (electronically or through U.S. Mail). You can be added to mailing lists by calling the INEEL toll-free number.

Toll-Free Phone Number

To obtain specific documents or other information, request a speaker or briefing on a particular topic, inquire about public meetings or public comment periods, or schedule a tour of INEEL, call the INEEL toll-free number at 1 (800) 708-2680.

Videos/Instructional Materials

Videos and brochures are available on a variety of subjects including the Snake River Plain Aquifer, waste management, and general INEEL history. To request these items, call the INEEL toll-free number.

Internet

The INEEL Home Page is available at http://www.inel.gov. Specific INEEL environmental information is available at http://environment.inel.gov. The INEEL Administrative Record is available at http://ar.inel.gov/home.html.

Information Repositories

DOE maintains three information repositories throughout Idaho. Information repositories are collections of documents that provide detail and backup information on INEEL cleanup projects.

INEEL Technical Library
DOE Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83415

Albertson Library
Boise State University
1910 University Drive
Boise, ID 83725

University of Idaho Library
University of Idaho Campus
434 2nd Street
Moscow, ID 83843

INEEL Idaho Falls Office

The INEEL Community Relations Office is located in Idaho Falls and can provide information and briefings on environmental management topics. Call the INEEL Community Relations Plan Coordinator, Erik Simpson, at (208) 526-4700, or call the INEEL toll-free number.

INEEL Boise Regional Office

An INEEL Regional Office is located in Boise to provide information and other resources for those living in the western portion of the state. The office is located at 800 Park Blvd., Suite 790, Boise, Idaho 83712, or call (208) 334-9572.

INEEL Jackson, Wyoming Office

An INEEL Regional Office is located at 310 A. E. Pearl Avenue to provide information and other resources for those living in Wyoming. Call INEEL Public Information Liaison, Lorie Cahn, at (307) 732-2990.

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